CLAIMS

1.   A policer based on Random Early Detection (RED), comprising:

    a filter that determines a filtered virtual time debt; and

    a control law circuit that receives the filtered virtual time debt from the filter and

determines whether a packet should be dropped.

2.   The RED policer of claim 1, wherein a virtual time debt uses a time T in which a

packet is expected to arrive and is computed using a predetermined output transmission

rate.

3.   The RED policer of claim 2, wherein predetermined output transmission rate is

given by a traffic contract.

4.   The RED policer of claim 1, wherein the filter is based on an exponential

    weighted moving average (EWMA) virtual time delay using the expression,

    $EWMA_k = (1-g)EWMA_{k-1} + g(VTD)_k,$

    where k indicates the presently received packet, and k-1 indicates the EWMA

computed when the last packet was received, the virtual time debt (VTD) is computed by

the expression: VTD = T(packet expected to arrive) − T(packet actually arrives), and g is

the gain of the filter.

5.   The RED policer of claim 1, further comprises a sampler that samples a virtual

time debt at a sampling interval, and transmits the sampled virtual time debt to the filter.

6.   The RED policer of claim 1, further comprises:

    a random generator that generates a number based on the control law circuit's

determination as to whether a packet should be dropped; and

    a counter that is set with the number generated by the random generator, wherein

the counter counts packets passing through the RED policer up to the set number, and

6 wherein the RED policer drops a packet when the counter has counted out the set num-

7 ber.

1 7. The RED policer of claim 6, further comprises:

2 the control law circuit that determines a probability of a packet being dropped

3 based on the filtered time debt exceeding a predetermined minimum threshold,

4 and specifies a range of numbers based on the probability; and

5 the random generator that randomly generates a number in the range specified by

6 the control law circuit.

1 8. A policer based on Random Early Detection (RED), comprising:

2 means for determining a moving average of a virtual time debt; and

3 means for determining whether a packet should be dropped based on a value of

4 the moving average of the virtual time debt.

1 9. The RED policer of claim 8, further comprises means for sampling a virtual time

2 debt at a sampling interval, and transmitting the result to the moving average determining

3 means.

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1 10. The RED policer of claim 8, further comprises:

2 means for generating a random number based on the result of the packet dropping

3 means; and

4 means for counting a number of packets passing through the RED policer up to

5 the random number generated by the random number generating means, wherein the

6 RED policer drops a packet when the counting means has counted out the generated ran-

7 dom number.

1 11. A network device comprising:

2 a plurality of Random Early Detection (RED) policers, wherein each RED policer

3 includes,

4 a filter that determines a filtered virtual time debt; and

5   a control law circuit that receives the filtered virtual time debt from the

6   filter and determines whether a packet should be dropped; and

7   a packet classifier that determines which packet should go to which RED

8   policer.

1   12.   A method of policing packets in a network device, the method comprising the

2   steps of:

3   determining a filtered virtual time debt of a traffic;

4   comparing the filtered virtual time debt with a predetermined minimum threshold;

5   and if the filtered virtual time debt exceeds the minimum threshold, then

6   generating a random number that is used to determine which packet should to

7   dropped.

1   13.   The method of claim 12, wherein generating a random number further comprises

2   the steps of:

3   generating the random number in a range based on a level by which the filtered

4   virtual time debt exceeds the minimum threshold;

5   setting a counter with the random number; and

6   dropping a packet when the counter has counted out the random number.

1   14.   A computer readable medium having instructions contained therein, which when

2   executed by a computer performs a method comprising the steps of:

3   determining a filtered virtual time debt of a traffic;

4   comparing the filtered virtual time debt with a predetermined minimum threshold;

5   and if the filtered virtual time debt exceeds the minimum threshold, then

6   generating a random number that is used to determine which packet should to

7   dropped.

1   15.   The medium of claim 14, wherein generating a random number further comprises

2   the steps of:

3 generating the random number in a range based on a level the filtered virtual time

4 debt exceeds the minimum threshold;

5 setting a counter with the random number; and

6 dropping a packet when the counter has counted out the random number.

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9 16. Electromagnetic signals propagating over a computer network, said electro-

10 magnetic signals carrying instructions for practicing the method of claim 12.

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